

Intensity Frontier Fellowship – 2013

**Development of
Liquid Argon Time Projection Chambers
for the Intensity Frontier**

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The liquid argon time projection chamber (LArTPC) is widely regarded as a critical detector technology for the next generation of neutrino physics and particle astrophysics experiments. This technology has been selected for the far detector of the LBNE experiment, based largely on the promise of highly efficient high-resolution reconstruction of neutrino events. There are only a handful of experiments that have run or are running using a LArTPC. The community of experts in this technology is small, but growing. Although I have no personal experience with LArTPC technology, I have followed its development worldwide and appreciate its great potential. The Intensity Frontier Fellowship enabled me to take an extended residency at Fermilab in order to become involved in the liquid argon R&D and make connections with the community centered there.

My activities were driven by two projects: LBNE and LArIAT.

For LBNE, I continued to establish and refine the physics case for LBNE, including sensitivity estimates, through the Physics Working Groups. In particular, I co-convoked the Nucleon Decay Physics Working Group, and was able to hold nearly monthly live meetings during my stay. The year 2013 coincided with the Snowmass Summer Study, for which I also had organizational responsibilities within the Intensity Frontier working group.

To acquire some personal experience with LArTPC technology, I joined the LArIAT experiment. A group of Fermilab and university scientists proposed to operate a modified ARGONEUT detector in a charged particle test beam at the Fermilab Test Beam Facility. The project is dubbed LArIAT, short for Liquid Argon In A Testbeam. I took on some modest hardware responsibilities related to readout electronics and TPC wireplane design. And I hosted an undergraduate student from Boston University (Ryan Linehan) who lived onsite during the summer and helped commission beamline elements for LArIAT.

I also took the opportunity to work with Fermilab engineer Jin-Yuan Wu on an electronics project related to water Cherenkov technology. As part of this project, we supervised two Illinois Math and Science Academy (IMSA) students who met with us weekly.